

EPFL Master course

*Philosophical perspectives on the
exact sciences and their history*

Introduction & Descartes on modern science

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What you are expected to do



- submit an essay plan, defend your plan in November-December and work out the essay by 1 May
- essay plan (ca. 3 pages): a brief introduction to your topic & situating the topic in the field of philosophy of science, a clear statement of your research question, an outline of how you intend to address that question
- final essay:
 - a) an introduction in which you spell out your research question, tell the reader why this question is interesting and put it into a general framework
 - b) a main part in which you develop your argument, give examples, discuss possible objections
 - c) a conclusion that sums up your results and contains an assessment

Teaching staff



- Professor

Michael Esfeld, michael.esfeld@unil.ch

- Assistant

- **Amine Rusi,
amine.rusielhassani@unil.ch**

- Postdoc

Cristian Lopez, cristian.lopez@unil.ch

Schedule autumn



- **Wed 9 Sept.:** Michael Esfeld: Descartes on modern science & Cristian Lopez: Physics and philosophy
- **Wed 16 Sept.:** Michael Esfeld: Newton on natural philosophy & Amine Rusi: Philosophy of space and time
- **Wed 23 sept.:** Michael Esfeld: Quantum physics: non-locality and the measurement problem & the ontology of quantum physics
- **Wed 30 Sept.:** Amine Rusi: Philosophy of artificial intelligence and consciousness & Michael Esfeld: Mind and free will
- **Wed 7 Oct.:** Michael Esfeld: What is a law of nature & The scientific and the manifest image of the world
- **Wed 14 Oct.:** Cristian Lopez: Mathematical structure and ontology & How to write an essay
- **by Mon 19 Oct.:** definite fixing of the groups and essay subjects

Schedule autumn



- Work on essay plan, at least one meeting with supervising assistant (scheduled via moodle); submit essay plan to supervising assistant one week before the oral discussion
- **Wed 25 Nov., 2, 9, 16 Dec.:** discussion of essay plan in class, 15 minutes presentation, 15 minutes discussion

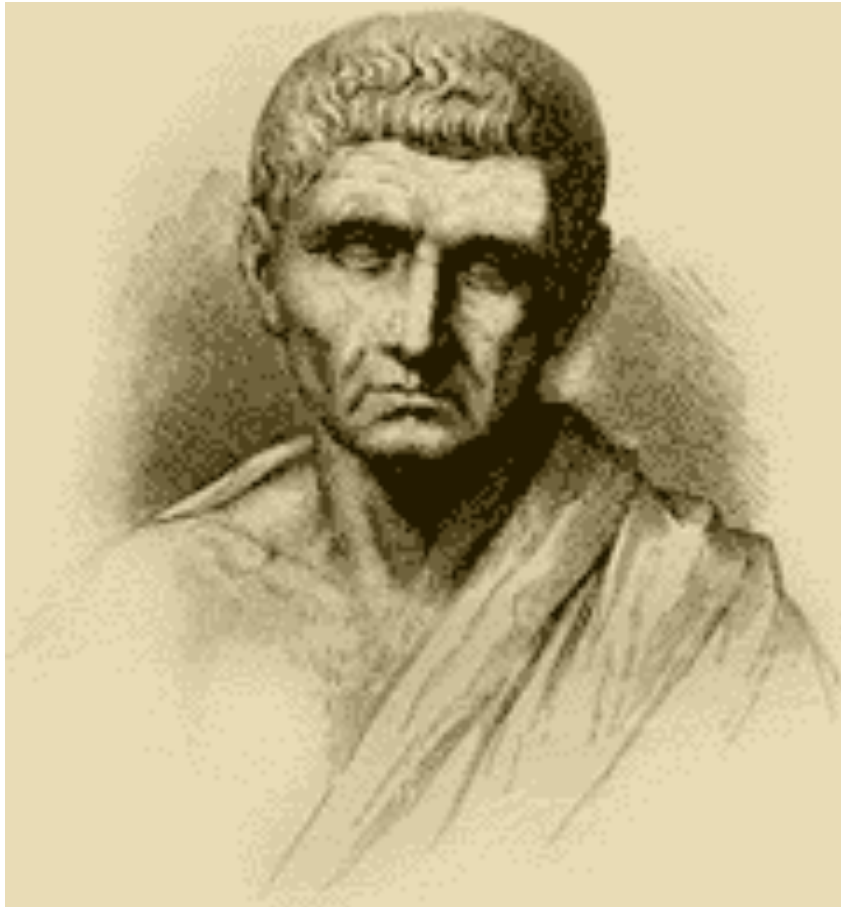
Schedule spring



- Work on essay, at least one meeting with supervising assistant in February
- **by 1 May:** submit essay
- **by 1 June:** submit final version of essay, if changes requested

Aristotle (384-322 B.C.)

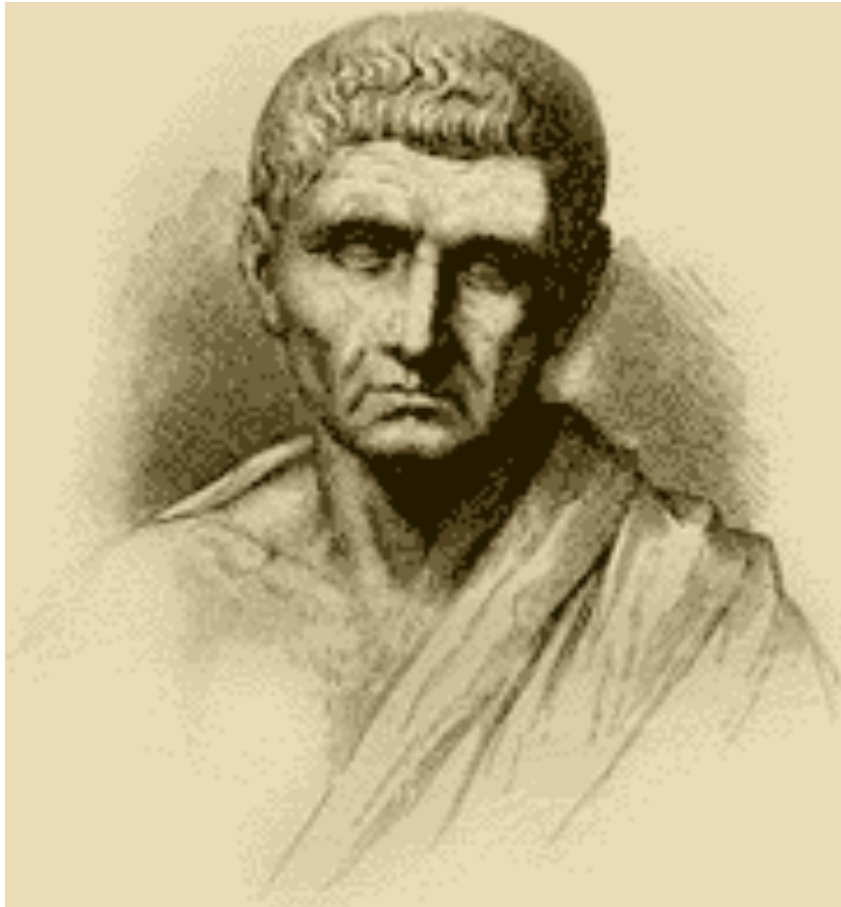
Metaphysics



- observation
- memory
- **experience**
- laws
- knowledge: science (epistémé)
- philosophy (théoria)

Aristotle (384-322 B.C.)

Metaphysics



- **physis**: the domain of what exists in itself, **by contrast to *techné*** = the artefacts created by us
- **physics**: the science of that domain
- **metaphysics**: what comes after physics, general principles of being
- **epistémé / théorie**: contemplation of being

René Descartes (1596-1650)

Discours de la méthode (1637)



“nous rendre comme
maîtres et possesseurs de la
nature”

→ modern science not
théoria; in the service of
improving human living
conditions

objectivity

methodological scepticism

principled limit in persons

Objectivity

Thomas Nagel (*1937)



point of view from nowhere (1986)

➔ abstract from all subjective features

Descartes: extension and motion

discover laws of motion

all measurement records: position records

two theories / worlds that agree on position distribution of matter throughout space-time indiscernible

laws: representation of patterns of motion that is simple & informative: systematicity, **mathematical expression**

science universal: genesis in European culture, but universal validity: only evidence and argument

Methodological scepticism

Karl Popper (1902-1994)



point of view from nowhere
impossible; regulative idea

➔ submit all knowledge
claims to rigorous scrutiny

experiment: repetition

Popper (1934): asymmetry:
scientific claims can be shown
to be false (demarcation
criterion), but their truth
cannot be established;
endorsed insofar as resist
attempts of falsification

Richard Feynman

“The value of science” (1955)



“Scientific knowledge is a body of statements of varying degrees of certainty—**some most unsure, some nearly sure, none *absolutely* certain.** Now, we scientists are used to this, and we take it for granted that it is perfectly consistent to be unsure—that it is possible to live and *not* know.”

The value of science: “**Of all its many values, the greatest must be the freedom to doubt.**”

Underdetermination



classical, Newtonian mechanics:
inertial motion & acceleration absolute
➔ absolute space & time

Leibnizian relationalism,
only relational quantities

Maxwell-Lorentz electro-
dynamics with fields

Wheeler-Feynman electro-
dynamics without fields

general relativity: absolute scale:
space-time intervals,
relative simultaneity

shape dynamics: instantaneous
configurations, only relational
quantities: scale invariance

QM with wave-function collapse,
indeterminism

QM without wave-function collapse
determinism, probabilities as in SM

positivist fallacy to infer ontology from formalism

Objectivity / limits

Descartes (1596-1650)



- **abstract from all subjective features**
- **strict separation between facts and norms**
- **principled limit in subjective perspective on the world: consciousness, thought and action**

Envoi



- Aristotle's distinction between experience and knowledge / *théoria*
- modern science: practical focus: improve human living conditions
- objectivity: view from nowhere; laws, mathematical expression, systematicity
- methodological scepticism
- principled limit in subjectivity: consciousness, thought, action: norms